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Device for sealing food product containers and food product container provided with such a device

5 The invention relates to a device for sealing food product containers, in particular drink containers, comprising: a sealing element adapted to engage on a wall of a food product container around a wall opening arranged in the wall, and an operating element adapted to co-act with the sealing element for displacing the sealing element between an opened position leaving the wall opening clear and a closed position sealing the wall opening. The invention also relates to a food product container provided with such a device.

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The liquid container stated in the preamble has already been known for a long time. The American patent specification US 4,077,538 thus describes a reclosable can for drinks or other foodstuffs. The known can is closed at the top by a seam-folded upper wall or cover. The upper wall is herein provided with a wall opening for passage of drink held
15 in the can. The can is further provided with a device connected to the upper wall for closing the can. The device herein comprises a rotatable sealing element and a standing operating element connected to the sealing element. The sealing element is preferably constructed from a non-permeable lip which, after rotation of the operating element, can cover or leave clear the wall opening whereby the passage of drink can thus be
20 respectively prevented or made possible. The advantage of the known can is that the can is reclosable, whereby the content of the can does not have to be consumed all at once but can, if desired, be consumed in portions at different times. Closing the passage opening of the can by means of the lip does somewhat enhance conservation of the content of the can, but mainly prevents the content of the can leaving or being able to
25 leave the can in simple manner. As well as the above stated advantage, the known can also has drawbacks. A significant drawback of the known can is that only mediocre sealing of the can is realizable. The sealing element cannot seal the can completely in liquid-tight manner, or can do so only briefly. In the sealing situation of the can the content of the can is however still accessible to micro-organisms and gas exchange can
30 take place freely between the atmosphere surrounding the can and the local atmosphere prevailing in the can. Particularly when the drink held in the can is carbonated, whereby an internal pressure will be built up in the can, the sealing element will be unable to seal the can sufficiently, as a result of which the carbon dioxide can and will escape. As

already generally known, a reduction in the carbon dioxide content of drink results in a - usually unwanted - change in the taste of this drink.

5 The invention has for its object, while retaining the above stated advantage of the prior art, to provide an improved device for sealing a food product container, using which the food product container can be sealed in substantially medium-tight manner.

10 The invention provides for this purpose a device of the type stated in the preamble, with the feature that the operating element is provided with coupling means for coupling to the food product container, and that the relative orientation of the sealing element and the operating element can be changed such that the operating element can cause the sealing element in the closed position to engage under bias on the wall for substantially medium-tight sealing of the food product container. By causing the sealing element to engage under bias on the wall of the food product container, the food product container
15 is sealed in substantially medium-tight manner. This not only prevents the possibility of the liquid and/or solid food product leaving the food product container in the closed position of the food product container, but also prevents gas exchange being able to take place between an atmosphere surrounding the food product container and an atmosphere prevailing in the food product container. In the case the food product is formed by a
20 carbonated drink, the carbon dioxide will remain confined in the food product container in the closed situation, whereby it will also be possible to maintain the carbon dioxide content in the food product container, which enhances the preservation of taste and the like. Using a device according to the invention it is moreover possible to prevent micro-organisms being able to move, in the closed situation, from outside the food product
25 container to a location inside the food product container. A constant composition of the food product can therefore be guaranteed with the device according to the invention in closed position, wherein the food product can also be conserved in relatively hygienic manner in the closed food product container. In the opened situation of the sealing element, the sealing element is generally situated substantially at a distance from the
30 wall, whereby removal of food product along the sealing element and via the wall opening can take place freely and preferably unimpeded. After sufficient removal of the food product, the sealing element can be displaced once again to the closed position, wherein a bias will be exerted directly or indirectly on the wall in order to realize the medium-tight sealing of the food product container. The bias exerted on the wall by the

sealing element can be adjusted in discrete or continuous manner by means of the operating element for a user.

5 The sealing element and the operating element can be located substantially on one side relative to the wall, but the sealing element and the operating element are preferably adapted to mutually enclose a part of the wall of the food product container. The operating element generally has to be readily accessible to the user and will usually be positioned substantially on an outer side of the wall. The sealing element is preferably located at least substantially inside the food product container. In this manner it is
10 possible to prevent, or at least counter, the sealing part - usually a sealing edge - of the sealing element becoming dirty relatively easily, which is often at the expense of the reliability of the medium-tight sealing.

In a preferred embodiment the mutual distance between the sealing element and the
15 operating element can be changed. The mutual co-action of the sealing element and the operating element is herein such that, in the case of translation and/or rotation of the operating element in the closed situation of the device, the sealing element will displace in a direction away from the operating element. In a closed position the sealing element will then rest under bias against the wall around the wall opening, and in an opened
20 position the sealing element will be positioned at least partially, but preferably wholly at a distance of the wall. Because the operating element - after mounting on a food product container - will be coupled by means of coupling means to the food product container, preferably to the wall, the possibility for translation of the operating element relative to the food product container will generally be limited, and will usually even be minimized
25 and become zero. In that case the operating element will only be rotatable relative to the wall. After rotation of the operating element relative to the wall and the sealing element, the sealing element will hereby be forced to displace relative to the wall and the operating element. It is noted that food product container should be interpreted in a broad sense. Understood here are all kinds of conventional containers and packages
30 which are used to conserve food products. The food products can herein be formed by: (carbonated) drinks, syrups, tablets, sweets, consumable sprinkling materials etcetera.

The sealing element engages via a seal on the wall of the food product container. In order to guarantee the medium-tight sealing in the closed situation of the device a

sealing layer will be advantageous. The seal will generally be formed by a flexible, sealing strip of material which is arranged on a part of the sealing element that is adapted to support under bias on the wall. It is also possible to envisage arranging the sealing strip of material on the wall itself at the location where the sealing element will support in the closed situation. Various conventional materials can be applied as sealing material. Preferably used are an elastic material, such as rubber, and/or a flexible foam with a closed cell structure. Examples of applicable materials are: ethylene vinyl acetate rubber (EVA), ethylene vinyl ethanol (EvOH) and silicone rubber.

10 In a preferred embodiment the coupling means are adapted to engage on a peripheral edge of the wall opening. The coupling means can herein be formed for instance by a projecting flange adapted to engage on a side of the wall remote from another part of the operating element. The operating element will thus be partially situated in the wall opening such that the operating element engages bilaterally on the wall. The projecting flange herein locks the mutual position of the operating element relative to the wall. The flange can herein engage on a part of the peripheral edge of the wall opening or can be positioned along the whole peripheral edge of the wall opening.

In another preferred embodiment the operating element is provided with at least one receiving space for a pin projecting from the wall. The pin preferably projects in the direction of a space enclosed by the food product container, so as to minimize the number of components protruding in the direction of the user. The pin is preferably formed by a cylindrical body, but can optionally also be designed in other manner. The mutual co-action of the pin and the receiving space prevents rotation of the sealing element. The sealing element is however displaceable along the pin, whereby translation of the sealing element relative to the wall and the operating element, for instance after rotation of the operating element, remains possible. The pin can be formed by a bent and/or folded part of the wall, but may also form part of an intermediate element, for instance a stationary intermediate ring, placed separately between the sealing element and the operating element. The intermediate ring is then preferably connected fixedly to the wall, wherein the pin preferably projects via the wall opening in the direction of the sealing element. The advantage of the intermediate ring is that the existing structure of a conventional food product container need not be changed in order to apply the pin in order to prevent rotation of the sealing element. It is then possible to suffice with an

intermediate ring or other type of intermediate element separately manufactured and arranged at a later stage. In order to further stabilize prevention of rotation of the sealing element, a plurality of (spaced-apart) projecting pins may be applied.

- 5 The operating element is preferably provided with a projecting engaging member for a user. The projecting engaging member generally facilitates opening respectively closing of the food product container. The engaging member can for instance be formed by a fin-like member. In addition to serving as handle, the projecting member can also serve to bound the maximum rotation of the operating element, since in particular food
- 10 product containers, such as drink cans, the wall opening is arranged asymmetrically in the wall, wherein after a determined rotation the projecting engaging member will engage on a seam-folded part of the wall, whereby further rotation of the operating element can be prevented. An outer edge of the operating element can also be given a profiled form, whereby this outer edge can effectively also function as engaging
- 15 member for the user.

- The operating element is preferably provided with a passage opening for the food product held in the food product container. From a hygienic viewpoint the passage opening can more preferably be sealed by a screening element forming part of the
- 20 sealing element and projecting in the direction of the operating element. This applies particularly in the case liquid food products, in particular drinks, are held in the food product container. The passage opening bounded by the operating element will then generally result in an improved sensation the user when the drink is consumed directly from the food product container, since the operating element - generally manufactured
- 25 from plastic - will provide a better sensation than the generally sharp peripheral edge of the wall opening. Furthermore, injuries to the user resulting from cuts from the peripheral edge can thus be prevented, or at least countered.

- The operating element is preferably provided with a venting opening. Particularly in the
- 30 case of liquid food products, usually drinks, a venting opening will be advantageous, particularly during removal of the drink from the drink container. Gurgling removal of drink can thus be prevented, or at least countered.

In a preferred embodiment the device is initially sealed in the closed situation of the device. In this manner a user can ascertain at the time of purchase whether the food product container has previously been (improperly) opened, and whether the content corresponds to a content with specific quality standards guaranteed by the manufacturer.

- 5 In a particular preferred embodiment the seal is formed by a mutual breakable connection between the sealing element and the operating element. The connection can for instance be formed by a rod. The seal is more preferably visible to the user, so that the user can see at a glance whether or not the device has been opened at an earlier stage. In a particular preferred embodiment, the rod is initially connected to the
- 10 peripheral edge of the venting opening incorporated in the operating element. The rod is thus visible to the user. During initial opening of the device the rod will be permanently detached from the peripheral edge, whereby the seal is visibly broken and wherein the venting hole can actually function as aeration and venting of the food product container.
- 15 The sealing element and the operating element preferably mutually co-act by means of a screw connection. When the relative orientation of the sealing element and the operating element is changed, the mutual distance of the two components will thus also be changed. In addition to screw (thread) connections, the use of other types of co-acting connections can also be envisaged, such as for instance a bayonet connection (bayonet
- 20 fitting).

The invention also relates to a food product container provided with such a device according to the invention. As already noted, the device can be applied in diverse types of (substantially) conventional food product container. The device is preferably

25 positioned in an upper wall of the food product container, since removal of the relevant food product generally takes place via the upper wall of the food product container. The food product container is preferably formed by a drink container, such as for instance a bottle, carton or can. In a drink container the wall opening through which the drink can be removed is generally also situated on the upper wall, or at least one of the upper

30 walls of the relevant drink container. The device will usually already be connected to the upper wall during the manufacturing process of the relevant drink container. During manufacture of a drink can a cover will first of all be provided with the device according to the invention, before the cover is seam-folded onto a body filled with drink.

The invention will be elucidated on the basis of the non-limitative embodiments shown in the following figures. Herein:

- figure 1a shows a perspective view of a device for closing a food product container according to the invention,
- figure 1b shows a semi-transparent, perspective top view of the device according to figure 1a,
- figure 1c is a semi-transparent, perspective bottom view of the device according to figures 1a and 1b,
- figure 1d is a semi-transparent side view of the device according to figures 1a-1c,
- figure 2a shows a perspective view of another device according to the invention in the closed situation,
- figure 2b shows a perspective view of the device according figure 2a in the opened situation,
- figure 2c is a perspective top view of the device according to figures 2a and 2b in closed situation,
- figure 3a shows a perspective cross-section of an alternative device according to the invention in closed situation,
- figure 3b shows a perspective cross-section of the device according to figure 3a in opened situation,
- figure 3c is a perspective bottom view of the device according to figures 3a and 3b in closed situation,
- figure 3d is a perspective top view of the device according to figures 3a-3c in closed situation, and
- figure 4 shows a schematic cross-section of a soft drink can provided with a device according to the invention.

- Figure 1a shows a perspective view of a device 1 for closing a food product container (not shown) according to the invention in closed situation. The device 1 comprises a sealing element 2 and an operating element 3 connected rotatably to sealing element 2. Sealing element 2 is adapted to be positioned inside the food product container, and operating element 3 (for a user) is adapted to be positioned outside the food product container. Sealing element 2 and operating element 3 mutually co-act by means of a

screw thread connection (see figures 1b-1d). The mutual distance between operating element 3 and sealing element 2 can be changed by means of rotating the operating element 3 relative to sealing element 2. In order to prevent simultaneous rotation of sealing element 2 during rotation of operating element 3, sealing element 2 is locked

5 two-dimensionally by means of two stationary pins (see figures 1c and 1d). The pins herein form part of an intermediate ring (see figures 1c and 1d). Sealing element 2 is provided for this purpose with two receiving spaces 4 for the two pins. Operating element 3 is provided with a projecting coupling flange 5 for clamping the operating element 3 in a wall opening of the food product container. Operating element 3 is

10 provided with a moon-shaped passage opening 6 for the food product held in the food product container. In the shown closed situation of device 1, the passage opening is filled by a likewise moon-shaped projection 7 in order to enable hygienic sealing of the space situated below operating element 3. Operating element 3 is provided with a fin-like projection 8 to facilitate rotation of operating element 3 by the user. In the shown

15 situation the device 1 is closed, whereby removal of food product from the food product container will not be possible. After arranging the shown device 1 on the wall of the food product container, an edge 9 forming part of sealing element 2 will support under bias on the wall, whereby a medium-tight sealing of the food product container can be realized. In the shown device 1 however, there is no physical contact present between

20 the edge 9 of sealing element 2 and the wall, since a sealing layer 10 is arranged between the two. This layer 10 can be fixed by means of an adhesive to the wall or to the edge 9 of sealing element 2. Operating element 3 is provided with a venting opening 11 in order to facilitate removal of - particularly liquid - food product. In venting opening 11 a free end of a rod 12 connected to sealing element 2 is now visible. The rod

25 will break and/or deform permanently once the operating element 3 is rotated relative to sealing element 2. Rod 12 therefore functions in fact as an indicator of whether the device 1 is still sealed or not. Device 1 is arranged in the shown situation on the food product container and marketed commercially as an assembly. Device 1 is preferably manufactured wholly, or in any case at least partially, from plastic. It is also conceivable

30 to manufacture the device 1 from a different material, such as for instance metal.

Figure 1b shows a semi-transparent perspective top view of the device 1 of figure 1a. In the present view the operating element 3 is shown semi-transparently. The other components are shown in the normal situation of device 1. Figure 1b shows clearly that

the sealing element is provided with a centrally located tubular member 11 provided with an internal screw thread 12. The tubular member 11 is also provided with a protrusion 13 located at a distance from screw thread 12 for the purpose of bounding the maximum relative rotation of operating element 3 and sealing element 2. In the present
5 embodiment the maximum angle of rotation amounts to (substantially) 120°. An opposite boundary of this maximum angle of rotation is formed by the moon-like projection 7 which is bounded in the closed situation by mutual co-action with passage opening 6. The mutual distance between screw thread 12 and protrusion 13 is here minimally the wall thickness of a projecting tubular member which forms part of
10 operating element 3 and which is provided with an external screw thread (see figure 1c). Also shown clearly in figure 1b is the intermediate ring 14 which is positioned concentrically relative to sealing element 2. The intermediate ring 14 is usually manufactured from plastic and is generally connected fixedly to the wall of the food product container.

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Figure 1c shows a semi-transparent, perspective bottom view of the device 1 of figures 1a and 1b. In figure 1c the sealing element 2 is shown semi-transparently. The other components of device 1 are however shown normally. In the present figure the projecting tubular body 15 forming part of operating element 3 is clearly shown. The
20 body 15 is herein provided with an external screw thread 16 and is provided on an inner side with a projecting counter-protrusion 17. Screw thread 16 is adapted to co-act with the screw thread 12 forming part of sealing element 2. The counter-protrusion 17 is herein adapted to co-act with the protrusion 13 forming part of sealing element 2, as already stated above. The intermediate ring 14 is now also clearly shown, wherein the
25 intermediate ring is provided with the above mentioned pins 18. Pins 18 are herein received in the receiving spaces 4 of sealing element 2, whereby only one-dimensional displacement of sealing element 2 is possible during rotation of operating element 3.

Figure 1d shows a semi-transparent side view of the device 1 of figures 1a-1c. Sealing
30 element 2 is once again shown semi-transparently. The wall of the food product container is now shown by means of a broken line 19. After rotation of operating element 3, sealing element 2 will be displaced linearly along the pins 18 in a (downward) direction away from operating element 3, whereby sealing element 2 comes to lie at a distance from wall 19. In this opened situation the food product can be

removed along the sealing element and via the wall opening (not shown). In an alternative embodiment the pins 18 are formed integrally by a deformed part of the wall of the food product container. Pins 18 can thus be formed by downward deformation of (punched) parts of the food product container, whereby a passage opening for the food product is also provided situated between pins 18.

Figure 2a shows a perspective view of another device 20 according to the invention in the closed situation. The operation very largely corresponds with the operation of the device 1 shown in figures 1a-1d. Device 20 comprises a top element 21, an intermediate layer 22 rotatably connected to top element 21, and a cover element 23 co-acting with top element 21 and intermediate layer 22. Arranged between intermediate layer 22 and cover element 23 is a sealing ring 24 which is connected to intermediate layer 22. Cover element 23 is provided with a receiving opening 25 for a pin 26 forming part of intermediate layer 22. Top element 21 is provided with a handgrip 27 and a profiled edge 28 to facilitate rotation of top element 21. Top element 21 is also provided with a venting opening 29 in which a flexible rod-like member 30 is received in the closed situation. The rod-like member 30 in fact seals the venting opening 29 in the closed situation. When top element 21 is rotated relative to intermediate layer 22 and cover element 23, the rod-like member 30 will be removed from venting opening 29. The cover element will simultaneously be displaced linearly along the pin 26, whereby removal of the relevant food product, usually drink, from the food product container can take place along cover element 23 and via intermediate layer 22 and a passage opening 32 arranged in top element 21 (see figure 2b).

Figure 2b shows a perspective view of the device 20 of figure 2a in the opened situation. Figure 2b shows clearly that top element 21 and cover element 23 are located a distance from each other, whereby removal of food product from the food product container can take place (see arrow A). Also shown is that rod-like member 30, temporarily deformed, rests against an underside of top element 21 until top element 21 is rotated back to the situation shown in figure 2a, whereafter the rod-like member 30 will once again extend into venting opening 29.

Figure 2c shows a perspective top view of the device 20 of figure 2a and 2b in closed situation. In the closed situation the passage opening 32 is sealed by means of a raised

part 33 forming part of cover element 23. Also shown is that handgrip 27 is provided with an eye 34 which co-acts with an elevated member 35 arranged in intermediate layer 22. The elevated member 35 prevents the top element 21 from being able to rotate in undesired and simple manner. Only after overcoming a determined bias can the eye
5 34 be carried over the elevated member 35, whereafter unimpeded rotation of top element 21 through a determined angle is made possible. Top element 21 can in fact therefore be locked in the closed position of device 20.

Figure 3a shows a perspective cross-section of an alternative device 36 according to the
10 invention in closed situation. Device 36 is arranged on a cover 37 of a drink can. Device 36 comprises an internal element 38 and an external element 39 co-acting with internal element 38. Internal element 38 is provided for this purpose with a cylindrical member 40 provided with an internal screw thread 41, and external element 39 is likewise provided with a cylindrical member 42 provided with an external screw thread 43.
15 Rotation of internal element 38 is prevented by locking of internal element 38 on one side. The one-sided locking is realized by mutual co-action of an irregular portion 44 arranged in cover 37 on the one hand and two fixation protrusions 45 forming part of internal element 38 and engaging on either side on the irregular portion 44 on the other. A part of external element 39 is arranged with clamp fitting in a passage opening for
20 drink arranged in cover 37. External element 39 herein engages on cover 37 on two sides. External element 39 is provided for this purpose with a projecting flange 46 for engaging on the inner side of cover 37, and a supporting edge 47 for engaging on an outer side of cover 37. External element 39 is also provided with a drinking opening 48 for a user, which drinking opening 48 is filled in the shown, closed situation by a
25 plunger member 49 forming part of internal element 38. In the shown situation a sealing edge 50 forming part of internal element 38 engages under bias on cover 37. A sealing edge (not shown) is preferably arranged between sealing edge 50 and cover 37 in order to ensure a long-term medium-tight sealing of the drink can. When external element 39 is rotated, internal element 38 will move linearly in a direction away from cover 37,
30 whereafter sealing edge 50 also comes to lie at a distance from cover 37, whereby the can is thus opened and removal of drink is made possible. This opened situation is shown in figure 3b. In the shown situation the maximum rotation of external element 39 has been reached, as a lip 51 forming part of external element 39 engages on an edge 52 forming part of cover 37. Figure 3b also shows that plunger member 49 of internal

element 38 has an surface with an inclining orientation relative to a remaining part of device 36. The higher situated part of plunger member 49 herein forms a boundary to excessive rotation of external element 39 in the direction of the closed position as shown in figure 3a.

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Figure 3c shows a perspective bottom view of device 36 of figures 3a and 3b in closed situation. Figure 3c shows in particular the mutual co-action of the irregular portion 44 and the fixation protrusions 45 enclosing the irregular portion 44, whereby rotation of internal element 38 relative to cover 37 and external element 39 can be prevented.

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Figure 3d shows a perspective top view of device 36 of figures 3a-3c in closed situation. Passage opening 48 of external element 39 is now filled by plunger member 49. Figure 3d also shows that external element 39 is provided with venting opening 53 to make it possible to prevent gurgling removal of drink. External element 39 is moreover provided with a profiled edge 54 to facilitate rotation of external element 39 for the user.

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Figure 4 shows a schematic cross-section of a soft drink can 55 provided with a device 56 according to the invention. Can 55 is filled with a carbonated soft drink 56. Can 55 is constructed from a base element 57, a body 58 connected to base element 57 and a cover 59 seam-folded round body 58. Cover 59 is provided with a passage opening 60 for drink. Device 56 is coupled to cover 59 and is adapted for renewed medium-tight sealing of cover 59. Cover 59 comprises for this purpose a guide means 61 connected fixedly to cover 59 and provided with a receiving space 62 for a slide 63 connected in guiding manner to guide means 61. Slide 63 is coupled by means of a flexible element 64 to a sealing element 64 located in can 55. By sliding the slide 63 along guide means 61 (arrow A) and positioning it on receiving space 62, sealing element 64 can be pulled firmly against cover 59 (arrow B) such that a medium-tight sealing is created. Cover 59 is however now provided with a rubber ring 65 to ensure the medium-tight sealing. So as to stabilize the position of sealing element 64 to some extent, cover element 64 is provided with a pin 66 which protrudes with clamp fitting through an opening 67 arranged in cover 59. A seal 68 is likewise arranged between pin 66 and opening 67. In order to facilitate displacement of slide 63, this latter is provided with a handgrip 69.

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It will be apparent that the invention is not limited to the exemplary embodiments shown and described here, but that numerous variants, which will be obvious to the skilled person in the field, are possible within the scope of the appended claims.